IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Alfred A. BARNEY et al. Art Unit : 2859
Serial No. : 09/779,437 Examiner : M. Jagan
Filed : February 9, 2001
Title : TEMPERATURE-SENSING COMPOSITION

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REPLY TO ADVISORY ACTION OF DECEMBER 23, 2003

Applicants offer the following remarks in response to the Advisory Action issued on December 23, 2003.

Claims 1-48 are pending. Claims 1, 15, 24, 32, 43, 45 and 48 are independent. Claim 50 was canceled in the previous Reply, but the Examiner indicates that it is rejected in the Advisory Action despite having entered the proposed amendment. Claim 50 should be indicated as canceled.

Rejections under 35 U.S.C. § 103

Claims 1-31 and 48

Claims 1-31 and 48 have been rejected under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent Publication 2002/0006153 to Ranson *et al.* ("Ranson") in view of U.S. Patent No. 6,322,901 to Bawendi *et al.* and U.S. Patent 5,986,272 to Britton, Jr. *et al.* See page 2 of the Advisory Action. Claims 1, 15, 24 and 48 are independent.

Independent claims 1 and 48 and claims dependent therefrom

Applicants have discovered a method of sensing temperature including detecting an emission intensity of light from a sensor and determining the temperature of a surface of a substrate from the emission intensity of light from the sensor. See independent claims 1 and 48.

The Examiner asserts that Ranson "discloses that the intensity of the luminescence from the sensor is detected, and a characteristic, e.g. a decay rate, of the detected luminescence intensity is used to determine the temperature" and that this is a teaching "that the temperature is determined from the detected emission intensity of light from the sensor." See Advisory Action

at page 2. Applicants respectfully disagree. Determining a decay rate of an intensity and then calculating a temperature based on the decay rate is not the same as detecting an emission intensity of light from a sensor and determining the temperature of a surface of a substrate from the emission intensity of light from the sensor.

A decay rate determination involves additional steps that are not part of Applicants discovery. For instance, decay rate measurement requires the measurement of multiple intensities over a measured period of time to determine a single temperature. See Ranson at Abstract and at ¶ 9-12 on page 1. Applicants detect the emission intensity of light from a sensor and determine the temperature of a surface from the emission intensity of light from the sensor, not multiple intensities measured over a period of time. Decay rate is not, as suggested by the Examiner, an emission intensity of light. In the case of Ranson, only decay rate and rise time are taught as being indications of temperature. See Ranson at ¶ 30 on page 3. Ranson does not suggest or teach that temperature of a surface can be found by detecting an emission intensity of light from a sensor and determining the temperature of a surface of a substrate from the emission intensity of light from the sensor.

Bawendi and Britton do not cure this deficiency of Ranson alone or in combination. The Examiner claims that Bawendi can be combined with Ranson because Bawendi teaches that a semiconductor nanocrystal in a binder is a fluorescent phosphor. Applicants respectfully disagree. The Examiner seems to rely on the discussion at column 2, line 47 to column 3, line 9 and column 10 line 64-Column 11 line 3 of Bawendi to support this assertion. See Office Action of 03/03/2003. These sections of Bawendi do not discuss a matrix on the surface of a substrate, the matrix including a semiconductor nanocrystal in a binder. In fact, Bawendi never refers to a binder, and does not describe a matrix that includes semiconductor nanocrystals in a binder. Instead, the sections chosen by the Examiner discuss preparation of semiconductor nanocrystals having an affinity for a suspending medium. A suspension medium is not a binder, as Applicants indicate at page 8 lines 7-24 of the Specification. A suspension involves dispersion of semiconductor nanocrystals in a dispersion medium; a stable suspension is formed when the semiconductor nanocrystals are prepared in such a way as to have an affinity for the dispersion

medium. Bawendi does not teach or suggest bonding nanocrystals to a binder or forming a matrix from nanocrystals in a binder.

Britton does not cure this deficiency of Bawendi, or the deficiency of Ranson. The Examiner claims that Britton teaches that fluorescent phosphors are known to be thermographic phosphors. Applicants respectfully disagree. Britton does not teach semiconductor nanocrystals in a binder or that semiconductor nanocrystals in a binder can be used for temperature measurement. The mere statement in Britton that properly taken in context reads that "a general discussion of temperature measurements using [certain] fluorescing phosphors (also called thermographic phosphors) ..." does not teach or suggest that other fluorescing materials such as semiconductor nanocrystals can be used as temperature sensors. See Britton at column 1, lines 39-41. None of Ranson, Bawendi, or Britton, alone or in combination teaches or suggests Applicants' discovery.

Finally the Examiner has not provided a motivation for combining the references. The Examiner states that

> there is a teaching to combine . . .since Ranson teaches that a thermographic phosphor is used as a luminescent element for determining the temperature of a surface, Bawendi teaches that a semiconductor nanocrystal in a binder is a fluorescent phosphor . . . and Britton teaches that fluorescent phosphors are known to be thermographic phosphors.

See Advisory Action at page 2. Applicants respectfully disagree. As discussed previously, Bawendi does not teach a semiconductor nanocrystal in a binder and does not teach that semiconductor nanocrystals in a binder can be used in temperature measurement. In addition, none of Bawendi, Britton or Ranson suggests or teaches that semiconductor nanocrystals in a binder can be used as temperature sensors. As a result, there is no motivation to combine the three references as suggested by the Examiner.

The Examiner also asserts that it would have been obvious to use semiconductor nanocrystals in a binder "since these luminescent elements [the thermographic phosphor in Ranson and a semiconductor nanocrystal in a binder] are known alternate types of thermographic phosphors, which are known to be useful in obtaining temperature measurements." See

Advisory Action at page 2. Applicants respectfully disagree. None of Britton, Ranson, or Bawendi, singly or in combination, teaches or suggests that semiconductor conductor nanocrystals can be used for temperature measurement.

For at least these reasons claim 1 and 48 are patentable over Ranson, Bawendi and Britton and combinations thereof. Applicants respectfully request reconsideration and withdrawal of this objection.

Independent Claims 15 and 24 and claims dependent therefrom

Applicants have also discovered a temperature sensor and a temperature sensing coating including a matrix containing a semiconductor nanocrystal, the matrix formed from a semiconductor nanocrystal and a binder. See independent claims 15 and 24.

The Examiner asserts that these claims are rejected based on "Ranson in view of Bawendi and Britton, where Bawendi teaches a matrix containing a semiconductor nanocrystal, where the matrix is formed from a semiconductor nanocrystal and a binder . . .. applicants argument that Bawendi fails to describe or suggest a binder is not persuasive since the applicant has not provided support showing why or how Bawendi fails to disclose or suggest a binder."

Applicants do not find any paragraph in Bawendi that refers to a "binder" which strongly indicates that Bawendi does not disclose a semiconductor nanocrystal in a binder. Furthermore, the term matrix appears only once in Bawendi and its appearance is in a different context than that used by Applicants. Matrix is used in Bawendi as a synonym for the overcoating shell or layer. See Bawendi at column 7, line 48. Applicants do not use the term in this way. See page 8 lines 11-24. Finally, as discussed previously, Bawendi's disclosure of semiconductor nanocrystals in a suspension is not the same as semiconductor nanocrystals in a binder.

As discussed previously, there has been no proper motivation to combine Ranson, Bawendi, and Britton provided. The Examiner's conclusion of obviousness appears to rest solely on an impermissible hindsight reconstruction of Applicants' discovery using random pieces of the prior art.

For at least these reasons, claims 15 and 24 are patentable over Ranson in view of Bawendi and Britton. Applicants respectfully request reconsideration and withdrawal of this rejection.

Independent Claims 32, 43, and 45 and claims that depend therefrom and Dependent claims 34-36

Claims 32, 33 and 37-47 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,075,493 to Wickersheim ("Wickersheim") in view of Bawendi, Britton, and U.S. Patent No. 5,233,020 to Hase *et al.* ("Hase"). See page 2 of the Advisory Action. Claims 32, 43 and 45 are independent.

Claims 34-36 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Wickersheim, Bawendi, Britton, Hase, as applied to claims 32, 33, and 37-47 above, and further in view of the prior art disclosed by the Applicants ("Prior Art"). See Advisory Action at pages 2-3. Claims 34-36 depend from independent claim 32.

Similar to the previous discussion of the combination of Ranson, Bawendi and Britton, the Examiner neither Wickersheim, and Hase (for claims 32, 33, 37-47) nor Wickersheim, Hase and the Prior Art (for claims 34-36) supply the important features missing from Bawendi and Britton. None of Wickersheim, Hase or the Prior Art provide semiconductor nanocrystals in a binder, or that semiconductor nanocrystals can be used for temperature measurement of a surface or as temperature sensors or in temperature sensitive coatings or paints.

As discussed previously, with respect to Ranson, Bawendi, and Britton, again there has been no proper motivation to combine Wickersheim with Bawendi, Britton, Hase and the Prior art provided. The Examiner's conclusion of obviousness appears to rest solely on an impermissible hindsight reconstruction of Applicants' discovery using random pieces of the prior art.

For at least these reasons claims 32, 43 and 45 are patentable over the combinations of Wickersheim, Bawendi, Britton, and Hase and claims 34-36 are patentable over the combinations of these references and the Prior Art. Applicants respectfully request reconsideration and withdrawal of these rejections.

Enclosed is a $110 for the Petition for 1 Months Extension of Time fee. Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

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